REMARKS

Claim Status:

Claims 1, 9 and 15 are amended herein. Claims 16-19 are added herein. Claims 1-19 are now pending. Applicant reserves the right to pursue the original claims, or any previously presented claims, in this and/or other applications. Applicant respectfully requests reconsideration of the above-referenced application in light of the amendments and following remarks.

Claim Amendment and Addition Support:

Independent claim 1 is amended herein. Support for the claim amendment is found in the specification-as-filed at least on page 6, line 24 through page 7, line 20.

Independent claim 9 is amended herein. Support for the claim amendment is found in the specification-as-filed at least on page 6, line 24 through page 7, line 20 and on page 12, line 32 through page 13, line 25.

Independent claim 15 is amended herein. Support for the claim amendment is found in the specification-as-filed at least on page 6, line 24 through page 7, line 20 and on page 12, line 32 through page 13, line 25.

New claims 16 and 17 are added herein. Support for new claims 16 and 17 is found in the specification-as-filed at least on page 6, line 24 through page 7, line 20.

New claims 18 and 19 are added herein. Support for the claim amendment is found in the specification-as-filed at least on page 13, lines 14-25.

Rejections under 35 U.S.C. § 103(a):

In the pending Final Office Action, claim 1 is rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,306,281 to Kelley ("Kelley") in view of U.S. Patent No. 4,761,208 to Gram et al. ("Gram"). Claim 2 is rejected under 35 U.S.C. § 103(a) over Kelley in view of Gram, and further in view of U.S. Patent No. 4,414,070 to Spence ("Spence"). Claims 3-5 and 7-8 are rejected under 35 U.S.C. § 103(a) over Kelley in view of Gram, and further in view of U.S. Patent No. 5,106,465 to Kaczur et al. ("Kaczur"). Claim 6 is rejected under 35 U.S.C. § 103(a) over Kelley in view of Gram and Kaczur, and further in view of German Patent No. DE-100,17,407 ("DE-407"). Claims 9-15 are rejected under 35 U.S.C. § 103(a) over Kelley in view of Gram and DE-407, and further in view of U.S. Patent No. 6,328,875 to Zappi et al. ("Zappi") and U.S. Patent No. 5,965,004 to Cowley et al. ("Cowley"). Applicant respectfully traverses all of the foregoing rejections.

Applicant submits that in light of the amendments made herein all of the rejections under 35 U.S.C. § 103(a) are moot. In addition, none of the references of record in the present application, alone or in combination, render obvious the claims as amended herein.

The test for patentability under 35 U.S.C. § 103(a) requires that (1) the scope and content of the prior art be determined; (2) differences between the prior art and the claims at issue be ascertained; and (3) the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. *See* "Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc.," 72 Fed. Reg. 57526, 57527

(Oct. 10, 2007) (hereinafter "Guidelines"). In an obviousness analysis, the controlling question is simply whether the differences between the prior art and the claimed invention are such that, despite the differences, the invention would have been obvious to one of ordinary skill in the art. See Guidelines at 57528 (The proper analysis is whether the claimed invention would have been obvious to one of ordinary skill in the art after consideration of all the facts, particularly the differences between the claims and the prior art). Applicant submits the claims as amended herein recite certain features that are not disclosed or otherwise suggested by the references of record or the knowledge generally available to one of ordinary skill in the art. These features represent, among others, the differences between the art of record and the claimed invention. Applicant submits that these inventive features render the claimed invention as a whole non-obvious over the art of record.

The inventive features recited in the present claims include, among others, (1) a source of an aqueous feed solution, the source comprising means for locally delivering a halogen dioxide salt to an aqueous feed solution inlet stream; and (2) a non-membrane electrolysis cell comprising an anode and a cathode, said anode and said cathode being separated by a non-conducting porous flow barrier, and said electrolysis cell having a cell chamber with an inlet for receiving said aqueous feed solution comprising halogen dioxide salt and an outlet for discharging effluent comprising halogen dioxide, wherein said anode comprises a plurality of porous flow passages through which at least a portion of the aqueous feed solution flows in a cross direction to a flow of electricity between the anode and the cathode, and wherein said flow barrier is structured and arranged to restrict flow of the aqueous feed solution through the cell chamber in a cross direction to the flow of electricity between the anode and cathode.

Independent claims 1, 9 and 15 recite, among other features, means for locally delivering a halogen dioxide salt to an aqueous feed solution inlet stream. The art of record fails to disclose or otherwise suggest a system comprising means for locally delivering a halogen dioxide salt to an aqueous feed solution inlet stream to form a halogen dioxide salt solution, *in situ*, which is then introduced to an electrolysis cell to convert the halogen dioxide salt to halogen dioxide. Kelley describes the preparation of stabilized sodium chlorite solutions using bench-top methods, i.e. pre-prepared solutions that are subsequently passed through the pipe cell described therein. See, for example, Kelley at column 4, lines 56-60, describing the pre-mixture of a solution that is then passed through a pipe cell. In addition, all 17 examples disclosed in Kelley utilize bench-top preparation of sodium chlorite or chlorine dioxide solutions subsequently passed through a pipe cell. The other references of record similarly fail to disclose or otherwise suggest means for locally delivering a halogen dioxide salt to an aqueous feed solution inlet stream, and therefore, fail to rectify the deficiencies of Kelley.

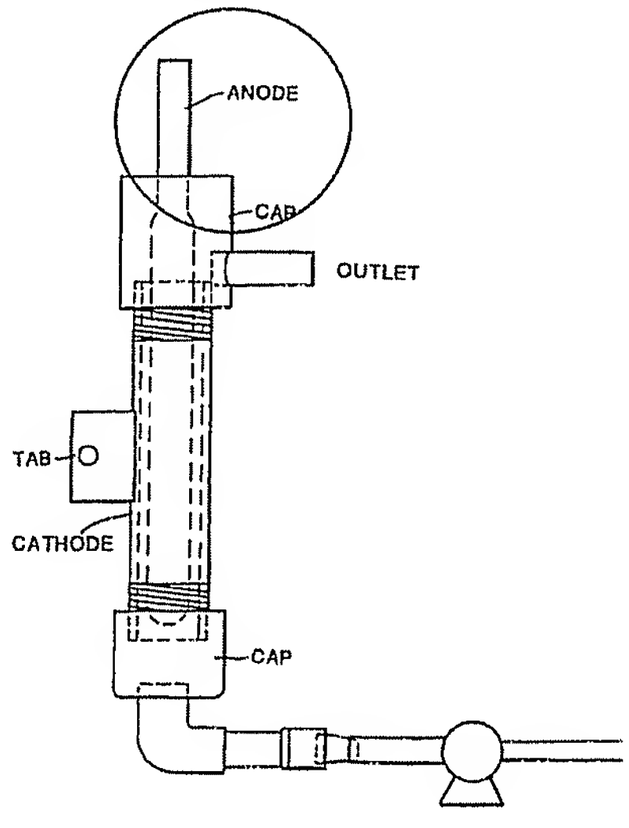
Additionally, independent claims 9 and 15 recite, among other things, (1) an anode comprising a plurality of porous flow passages through which at least a portion of the aqueous feed solution flows in a cross direction to a flow of electricity between the anode and the cathode, and (2) a flow barrier that is structured and arranged to restrict flow of the aqueous feed solution through the cell chamber in a cross direction to the flow of electricity between the anode and cathode. As stated by the Office in the pending Final Office Action, Kelley fails to teach a porous anode. The Office relies upon Kaczur for the disclosure of a porous anode. However, Kaczur only discloses "porous or high surface area anodes" in general, and fails to disclose or otherwise suggest an anode having flow passages disposed such that an aqueous feed solution

flows in a cross direction to the flow of electricity between the anode and the cathode.

Moreover, Applicant submits that, for sake of argument, even if Kaczur suggested an anode having flow passages as claimed herein (which is clearly does not), one of ordinary skill in the art would readily recognize that the pipe cell described in Kelley is technically incapable of functioning with such an anode structure. Specifically, as set forth in column 3, lines 8-21 in Kelley:

> The electrolytic cell is shown in FIG. I. The outer wall of the cell comprises a metal pipe, such as a stainless steel pipe, with a tab welded onto the surface to act as a connector for the electric connection (cathode). The anode is positioned in the center of the pipe and insulated from the cathode by plastic caps at both ends of the stainless steel pipe. The anode is either carbon plated with lead dioxide or a dimensionally stable anode (i.e., a metal such as titanium coated with a precious metal group such as platinum, palladium or iridium). The flow of liquid is into the bottom of the cell and out of the top of the vertically mounted pipe. A source of DC voltage is connected to the pipe flow cell, – to the cathode and + to the anode. No membrane, asbestos barrier, or resin bed is required in this simple cell design.

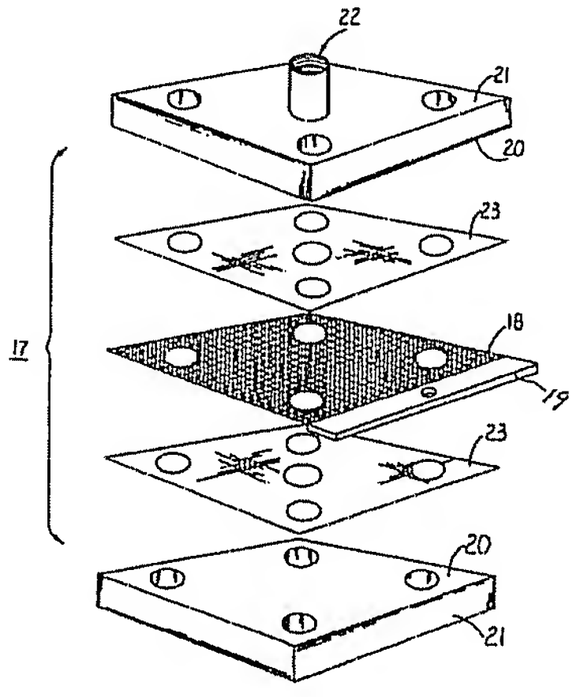
The anode in Kelley is positioned concentrically inside a cylindrical pipe cathode, parallel to the flow of solution through the pipe cell, and the anode is held in position by caps at both ends. In addition, the anode extends outside the pipe cell as illustrated in FIG. 1 in Kelley.



One of ordinary skill would readily recognize that these end caps would provide a barrier to the flow of aqueous feed solution through a porous anode. Moreover, the extension of the anode outside of the pipe cell would preclude the use of internal flow passages through the anode, which would prevent the flow of aqueous feed solution in a cross direction to the flow of electricity between the anode and the cathode. Accordingly, the pipe cell disclosed in Kelley would be incapable of functioning with the anode structure recited in the amended claims. Thus, modifying the pipe cell in Kelley to include a porous anode would necessarily render the pipe cell in Kelley unsatisfactory for its intended purpose or at least change the principle of operation of the pipe cell. *See* MPEP 2143.01.V and VI. Therefore, one of ordinary skill in the art would have no reason to modify the pipe cell in Kelley to include a porous anode.

As stated by the Office in the pending Final Office Action, Kelley fails to teach non-conducting porous flow barriers separating the anode and cathode. The Office relies on Zappi for the disclosure of "[n]on-conductive electrode spacers 23 positioned between electrodes provid[ing] the desired interelectrode gap or spacing between adjacent anodes and cathodes." *See* Zappi at column 10, lines 18-21). This structure is illustrated in FIG. 4 in Zappi.

FIG 4.



As illustrated in FIG. 4 above, the cathode 18 is sandwiched between two electrode spacers 23, which are themselves sandwiched between two anodes 21, forming an electrode stack 17. As described in Zappi, the electrode spacers 23 function to "provide the desired interelectrode gap or spacing between adjacent anodes and cathodes." (col. 12, lines 32-34). This is a markedly different function than that performed by the non-conducting porous flow barrier recited in the amended claims.

As set forth in the amended claims, the non-conducting porous flow barrier is structured and arranged to restrict flow of the aqueous feed solution through the cell chamber in a cross direction to the flow of electricity between the anode and cathode. One of ordinary skill in the art would readily recognize that the electrode spacers 23 disclosed in Zappi are structurally incapable of performing this function. First, the sandwich construction described in Zappi and the positioning of the supply line inlet 22 render the electrode stack 17, and therefore the cell 10, structurally incapable of facilitating flow of an aqueous feed solution through a cell chamber in a cross direction to the flow of electricity between the anode and cathode (the flow of solution and electricity is necessarily parallel in Zappi). Second, the electrode spacers 23 in Zappi are planar sheets of material that have pores parallel to the direction of flow of electricity in the electrode stack 17, where the spacers are intended to be bolted between the anode and cathode in direct contact with the adjacent electrodes.

Accordingly, if one of ordinary skill in the art were to apply the electrode spacers 23 in Zappi to the pipe cell in Kelley, then an electrode spacer 23 would have to be reshaped into a cylinder and positioned in the annular space between the pipe cathode and concentric anode in the pipe cell. However, in implementing this application, the pores through the electrode spacer

from Zappi would be perpendicular to the solution flow in Kelley. Consequently, because the pores would be diametrically opposed to the flow direction, the electrode spacers of Zappi would block the flow of electrolyte solution through the pipe cell in Kelley. This would necessarily render the pipe cell in Kelley unsatisfactory for its intended purpose or at least change the principle of operation of the pipe cell. *See* MPEP 2143.01.V and VI. Thus, one of ordinary skill in the art would have no reason to apply the electrode spacer of Zappi to the pipe cell of Kelley.

Furthermore, as described above, Zappi discloses the electrode spacers solely for providing the "desired interelectrode gap or spacing between adjacent anodes and cathodes." Also as described above, Kelley discloses that "[t]he anode is positioned in the center of the pipe and insulated from the cathode by plastic caps at both ends of the stainless steel pipe." Accordingly, Kelley teaches structures (i.e. caps) for positioning the anode within the cathode and having the desired interelectrode gap or spacing. Thus, one of ordinary skill in the art would again have no reason to apply the electrode spacers from Zappi to the pipe cell in Kelley because Kelley already teaches structures for performing the function served by the electrode spacers.

As set forth in the specification-as-filed on page 12, line 32 through page 13, line 25, the non-conducting porous flow barrier recited in the amended claims is structured to restrict the flow of halogen dioxide salt solution through the cell chamber. This restriction is provided in order to increase the pressure drop through the cell chamber so that the halogen dioxide salt solution will flow preferentially through the porous anode in a cross direction to the flow of electricity between the anode and cathode. None of the references of record disclose or suggest either (1) the partial flow of halogen dioxide salt solution through the porous anode in a cross direction to the flow of electricity between the anode and cathode, and (2) the utilization of a

non-conducting porous flow barrier positioned within a cell chamber between an anode and a cathode to facilitate to fluid dynamics of the system. Therefore, given the markedly different functions performed by the porous flow barrier recited in the amended claims, the elements disclosed in the references of record are structurally distinguishable form the elements recited in the amended claims. This is because the presently claimed invention is substantially different than what is disclosed in the references of record, and moreover, represents an inventive step over the prior art in general.

Independent claims 1, 9 and 15 are non-obvious. If an independent claim is non-obvious under 35 U.S.C. §103(a), then any claim depending therefrom is non-obvious. *See* MPEP 2143.03. Therefore, claims 1-19 are all non-obvious.

Claims 16 and 17 are directed toward particular means for locally delivering halogen dioxide salt to an aqueous feed solution inlet stream. Claims 18 and 19 are directed toward particular porous flow barriers. For the reasons set forth above, claims 16-19 are patentable over the art of record on their own merits.

Based on the foregoing, Applicant respectfully requests withdrawal of the rejection of claims 1-15 under 35 U.S.C. § 103(a), and prompt allowance of claims 1-19 as set forth herein.

CONCLUSION

Applicant requests that the present rejections be withdrawn. Applicant submits that claims 1-19 of the present invention recite systems and devices for the electrolytic generation of halogen dioxide that are both novel and non-obvious relative to the prior art of record in the present application. In view of the foregoing, Applicant respectfully submits that the present application is in condition for allowance. Accordingly, allowance of the claims at an early date is respectfully requested.

If the undersigned can be of assistance to the Office in addressing issues to advance the application to allowance, please contact the undersigned at the number set forth below.

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Date

Respectfully submitted,

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